

PDS Imaging Node Node Report & Plans for PDS4 Roll-out

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August 29, 2012
PDS Management Council Meeting
Columbia, MD

Outreach: Planetary Data Workshop

June 25-29, 2012, Flagstaff, AZ

Attendees:

- 168 unique registrations
- U.S. and international participation

Missions represented:

- ~21 Total: Active, **Historic**, non-US

- Cassini ISS, VIMS, workshop
- LRO Diviner, LOLA, LROC NAC, WAC
- LRO/Ch-1: Mini-RF
- MRO CRISM, HiRISE
- MO THEMIS
- MESSENGER MDIS, MLA
- MER
- MSL

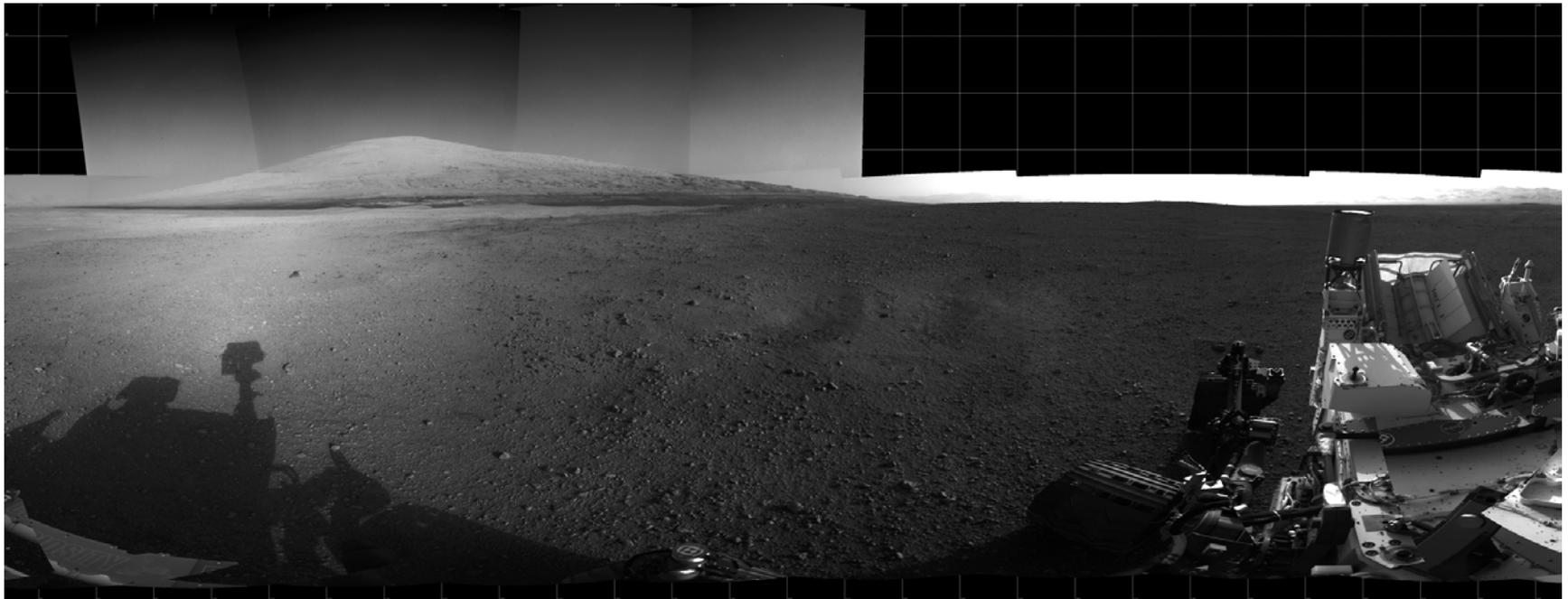
- Meeting report submitted to Eos, Transactions of AGU
- Abstracts and (most) presentations online at meeting site
- Abstract volume in preparation

- Lunar Prospector
- Apollo Metric/Pan
- Mariner 9
- MEX/OMEGA, HRSC
- SELENE Kaguya

Photojournal – Record Download Volume

Metrics:

- In the 10 days following the successful MSL landing
 - Over **12.2 TB** downloaded (typical month = 7-8 TB)
 - 67 images/releases added to the system (typical month = 100)



<http://photojournal.jpl.nasa.gov/index.html>

PDS Imaging Node

U.S. Geological Survey

Jet Propulsion Laboratory

PDSMC August 28-29, 2012

FY12 Data Releases & Volumes

Project/Instrument	Q1 Release (est)	Q2 Release (est)	Q3 Release (est)	Q4 Release (est)	FY12 Volume in TB (est)	Overall Volume in TB (end FY11)	Overall Volume in TB (est end FY12)
CAS/ISS	12.5 GB (Oct 1)	4.0 GB (Jan 1)	8.0 GB (Apr 1)	9.1 GB (Jul 1)	0.04	0.42	0.46
CAS/RADAR	1.0 GB (Oct 1)	1.2 GB (Jan 1)	2.0 GB (Apr 1)	.03 GB (Jul 1)	0.01	0.08	0.09
CAS/MIMS	6.3 GB (Oct 1)	6.0 GB (Jan 1)	3.0 GB (Apr 1)	6.8 GB (Jul 1)	0.02	0.13	0.15
MO/THEMIS	10.6 GB (Oct 1)	90.0 GB (Jan 1)	78 GB (Apr 1)	99 GB (Jul 1)	0.3	10.4	10.7
MER/Cameras	105 GB (Nov 23)	116 GB (Feb 23)	93 GB (May 24)	100 GB (Aug 28)	0.4	6.19	6.59
MRO/HiRISE	2.2 TB (Dec 1)	2.0 TB (Mar 1)	6.0 TB (Jun 1)	2.0 TB (Sep 1)	12.2	61.6	73.8
MRO/CTX	150 GB (Dec 1)	175 GB (Mar 1)	159 GB (Jun 1)	200 GB (Sep 1)	0.7	4.94	5.64
MRO/MARCI	50 GB (Dec 1)	57 GB (Mar 1)	54 GB (Jun 1)	60 GB (Sep 1)	0.23	1.42	1.65
MES/MDIS	n/a	50 GB (Mar 8)	n/a	50 GB (Sep 15)	0.1	0.15	0.25
LRO/LROC	26.2 TB (Dec 15)	26.0 TB (Mar 15)	23.8 TB (Jun 15)	21.5 TB (Sep 15)	97.5	194.8	292.3
LRO/LAMP	271 GB (Dec 15)	338 GB (Mar 15)	336 GB (Jun 15)	350 GB (Sep 15)	1.3	2.25	3.55
CH/M3	1.27 TB (Sep 9)	n/a	n/a	n/a	1.27	3.77	5.04
					114.07	286.15	400.22

Red text represents volume estimates

Imaging Node Activities for PDS4

- Status of software and tool testing
- Data migration analysis and plans for FY13
- First mission supported in PDS4
- Systems and tools to be delivered

PDS4 Software & Tool Testing

- **Mars Pathfinder (MPF) IMP**

- **Imaging Instrument Parameter Class**

- In good shape for this data set and Clementine (below)

- **Collections & Bundle**

- Preliminary collections created
 - Will work with draft scripts to test automatic creation of labels, collections, bundle
 - Expect to have completed sample bundle *within 2 weeks*

- **Clementine 750nm Basemap**

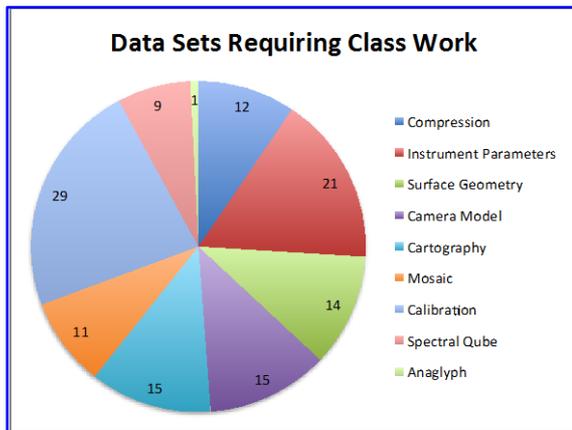
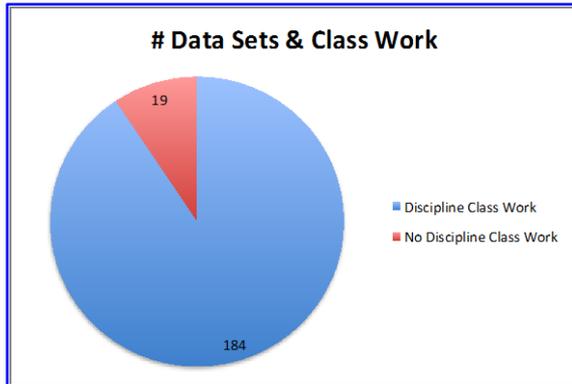
- **Cartography Class**

- Incorporating Federal Geographic Data Committee (FDGC) model. Still needs a bit of fine tuning.

- **Collections & Bundle**

- Data, document and XML schema collections created (using 900B schema and 'schematron'), including PDS4 XML labels and sample products
 - Will add 'Browse' collection to exercise a 'connect' for context products within the bundle
 - Expect to have completed sample bundle *within 2 weeks*

Imaging Node: PDS4 Data Migration



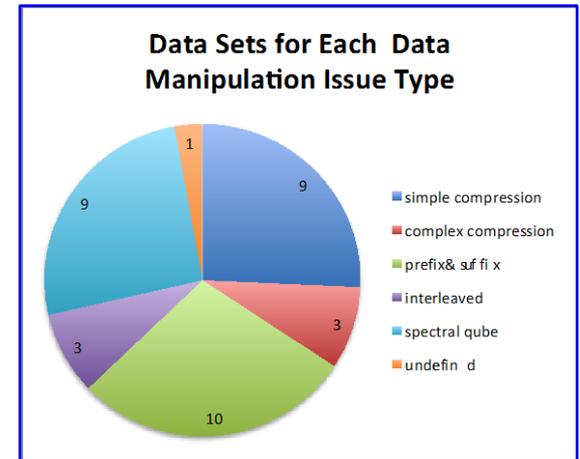
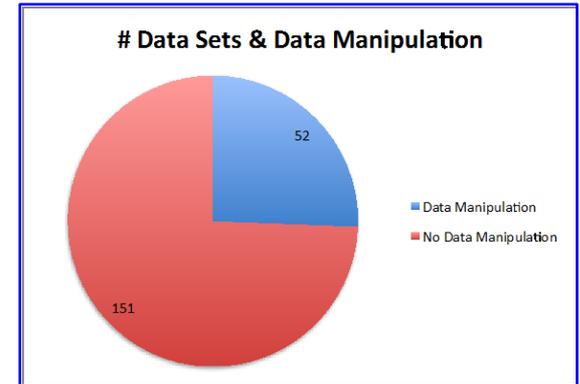
• **IMG manages a lot of complex data with a wide variety of formats**

- 203 datasets, ~13 M products
- *Many of these are not PDS4-compliant*

• **90% of IMG datasets require**

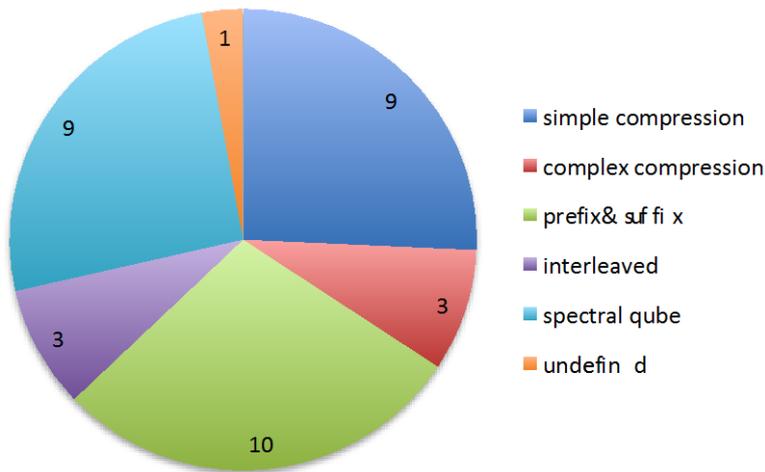
- **Assessment & revision of classes of keywords**
 - Discipline Classes
 - PDS-wide Classes
- **Manipulation of data to achieve compliance**
 - 25% of IMG datasets

• **BUT, we assume that migration of all datasets is not required**



IMG Data Migration: Data Manipulation

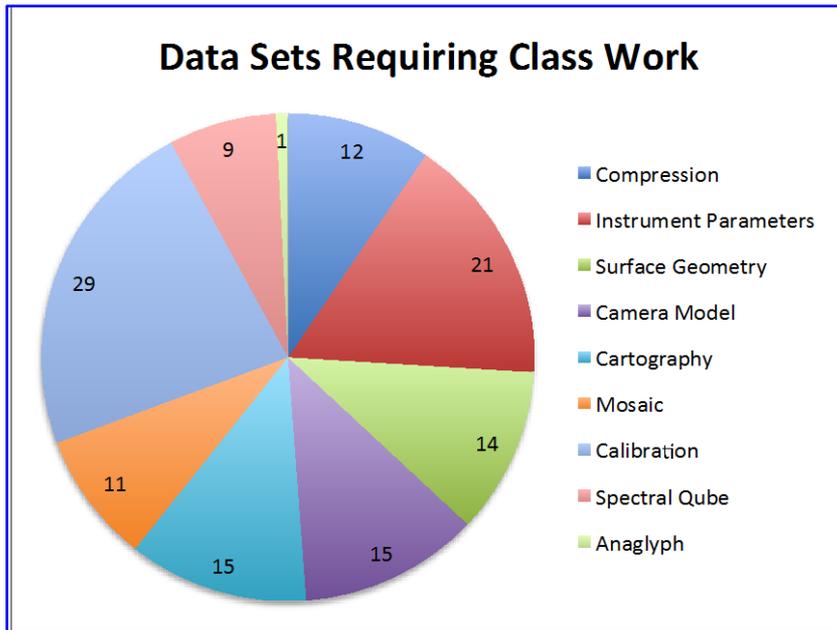
Data Sets for Each Data Manipulation Issue Type



• Data Manipulation

- 25% of IMG datasets
 - 52 of 203 datasets
- Potentially very time consuming and costly
- Process:
 - Engage experts
 - Software development & testing
 - PDS-wide conversion tool(s)?
 - V&V
 - Peer Review?
 - Release
- Issues:
 - Retain PDS3 version – forever?

IMG Data Migration: Classes



- **Class development requires**
 - IMG for Discipline-specific classes
 - Cross-node participation for many others
- **Classes needed for IMG**
 - **Note:** Not all are included on chart
 - Calibration – PDS-wide
 - Compression – PDS-wide
 - Geometry
 - Camera Models, Orbital, Landed – IMG
 - Surface Geometry – PDS-wide
 - SPICE/Orbital Geometry – PDS-wide (NAIF?)
 - **Cartography – IMG**
 - **Imaging Instrument Parameter – IMG**
 - Telemetry Parameters – IMG
 - Command Parameters – IMG
 - Processing History – IMG
 - Imaging Instrument Compression – IMG
 - Mosaic – IMG
 - Anaglyph (?) - IMG
 - Spectral Qube (?) - IMG

Data Migration Plans

- **Data Set Prioritization**

- **Mars Pathfinder (MPF) IMP** – Sample Bundle nearly complete
 - Simple camera data set with no data manipulation
 - Good way to start **Imaging Instrument Parameter Class**
- **Clementine 750nm Basemap** – Sample Bundle nearly complete
 - Straightforward map-projected data set with no data manipulation
 - Drives **Cartography Class** development
- Mars Pathfinder (MPF) Rover Products (images, tables, engineering)
 - Simple images, tables and engineering data with no data manipulation
 - Mods to Imaging Instrument Parameter Class for engineering data
 - Good follow-on to IMP data set
- Magellan FMAP
 - Radar map data set with no data manipulation
 - Mods to Imaging Instrument Parameter Class for radar and Cartography Class
 - Good follow-on to Clementine data set
- MOC EDR
 - Push-broom camera data set requiring data manipulation (compression)
 - Mods to Imaging Instrument Parameter Class for push-broom camera, drives Compression Class
 - Good test of compression & data manipulation

- **Then...TBD**

- Next data set priority will depend on availability of tools & systems that support both PDS3 & PDS4 data sets, drivers from the community, etc.

First PDS4 Mission

- **InSight**

- Recently selected Discovery Mission to look into the deep interior of Mars
- PDR & CDR in 2014
- Launch March 2016
- First PDS Release January 2017
- Payload
 - Instrument Deployment Cameras (built-to-print NAVCAMs) used to characterize the workspace and support instrument placement; operate during 30-sol deployment phase
 - Science instruments include Seismic Experiment (SEIS) and Heat Flow and Physical Properties Package (HP3)
- Imaging Node Involvement
 - Approximately 2400 images (EDR, CDR, RDR) produced by MIPL/OPGS
- Draft Data Management Plan included in the proposal written by Sue

Systems & Tools

- **General**

- Deploy and integrate PDS4 services and tools as they become available
- Deployed Registry software within IMG-JPL and IMG-USGS
 - Opportunity for testing, training, tool development and feedback to EN
 - Will begin populating with reference and tool information to enable linking product to supporting material
- Modified IMG-JPL web logs in preparation for Report Service ingestion and implementation

- **Atlas, PILOT**

- As IMG data sets are migrated, search will support both PDS3 & PDS4 searches
- Will use available tools developed by others & develop what is needed for IMG-specific applications
 - TBD, because we don't know what others are developing

Back-up Slides

Data Migration Plans

- **Process**

- Identify data set for migration
- Create/update Discipline Classes, provide input to PDS-wide Classes
- Map PDS3 to PDS4 labels and ancillary files/data
- Create schema
- Modify existing software tools & scripts to automatically create labels, collection and bundles
- Generate Sample Bundle(s)
- Verify
- Iterate
- Identify next data set
-

- Repeat iterative process until Data Model and Classes are “final”, refining all along the way. Then perform the full data set migration on priority data sets
- In parallel with migration activities, integrate PDS4 services and tools Imaging Node systems and into Atlas, PILOT

Mission Interface: Current Work

- **Current Mission Archiving**
 - Cassini
 - LRO
 - MRO
 - MER
 - MESSENGER
 - Odyssey
- **Developing Missions**
 - InSight
 - MSL
 - JUNO
- **Other Activities**
 - Planetary Image Atlas integrated into Mission Ops for Cassini, MER, MSL
 - Archive volume generation software included in MSL pipeline
 - Updating validation software for insertion in MER pipeline

Mission Interface: Data Nodes, Deep Archive

- **HiRISE Data Node (UofA, Tucson, AZ)**
 - Quarterly deliveries continuing (6/1/12 data release of ~6 TB)
 - Transfer of complete HiRISE EDR data set to IMG Flagstaff continues
- **THEMIS Data Node (ASU, Tempe, AZ)**
 - Quarterly deliveries continuing (7/1/12 data release of ~99GB)
- **LROC Data Node (ASU, Tempe, AZ)**
 - Quarterly deliveries continuing (6/15/12 data release of ~24 TB)
 - LROC SOC plans to reprocess all previously released data (releases 1-8)
 - **Electronic transfers to IMG-JPL completed; EDRs will be stored at Data Node, IMG-JPL & IMG-Flagstaff; CDRs at IMG-JPL & Data Node**
 - **~300 TB** of data storage hardware in-hand at each site
- **NSSDC ‘deep archive’ transfer**
 - **Viking Orbiter and Magellan volume transfer complete**

FY12 Other Data Acquisition & Synching

Project/ Instrument	Notes	Q3 Volume	Total FY12 Volume
LRO/LROC	Completed rsync of data from UofA to IMG-JPL; will now begin data brick transfer to IMG-USGS	~300 TB	~300 TB
MER/Cameras	Working with GEO to correct and/or document problems in labels and metadata	n/a	n/a
MER/PANCAM Science	IMG serving a copy of this GEO dataset; received first set, more to come		170 GB
MER/Cameras	Rsynced copy of entire holdings to UCL (England); after caught up will sync each release		6.5 TB
MEX HRSC	Received a new data brick from Geo and will add to holdings	~8 TB	~16.2 TB
MRO/RSDS	RAID problems on project side delayed deliveries, resulting in very large backlog		1.2 TB
		~ 308 TB	~ 324 TB

Data Migration Scope & Content Analysis

PDS4 Migration Scope & Content - Rollup							
Data Set Name/Description	Data Set ID/Instrument	Data Product Type	Issues causing data manipulation	Discipline Class Work Needed	other notes	# Products (8/10/12)	# Data Sets
Cassini							
Ground & Flight Calibration	Cassini ISS Ground & Flight Cal	image	line prefix table, row suffix, zip compression but	none		total 0	1
EDR	Cassini ISS EDR	image	image line prefix, table line prefix, table row suffix, binary label header	none		total 288,837	2
EDR	Cassini VIMS EDR	cube	spectral cube	spectral cube; instrument (infrared spectrometer)		total 255,139	1
BDR	Cassini RADAR xBDR	table	some zipped	compression; instrument (radar)		total 336	5
Radiometric & Geometric Correction (mosaic)	Cassini ISS Mosaic	image projected & mosaicked	none	calibration; cartography; mosaic		total 145	1
Radiometric & Geometric Correction (mosaic)	Cassini RADAR Mosaic	image projected & mosaicked	zip compression. SIS talks about back and side planes, however they are stored in separate files	compression; instrument (radar); geometry/cartography; mosaic		total 1,680	1
Chandrayaan-1							
Ground Calibration	Chandrayaan-1 M3 Ground Cal	don't know format				total 0	1
EDR	Chandrayaan-1 M3 EDR	image	line prefix table, line_interleaved	instrument (hyperspectral)		total 10,563	1
Radiometric Correction	Chandrayaan-1 M3 CDR	image	line_interleaved	calibration; instrument (hyperspectral)		total 6,347	2
Lunar Reconnaissance Orbiter (LRO)							
EDR	LRO IAMP EDR	images & tables	fits data format	instrument (ultraviolet spectrometer)		total 12,006	1
Radiometric Correction	LRO IAMP CDR	images & tables	fits data format	calibration; instrument (ultraviolet spectrometer)		total 11,308	1
Radiometric & Geometric Correction (single frames)	LRO IAMP RDR	image projected	none	calibration; cartography; instrument (ultraviolet spectrometer)		total n/a	1
EDR	LRO LROC EDR	image	none	none		total 739,910	1
Radiometric Correction	LRO LROC CDR	image	none	calibration		total 739,819	1
Radiometric & Geometric Correction (mosaic)	LRO LROC Mosaic	image projected & mosaicked	none	calibration; cartography; mosaic		total 149	1
Mars Exploration Rover (MER)							
Ground Calibration	MER DESCAM, HAZCAM, NAVCAM Ground	image	none	calibration; camera model		total 0	2
EDR	MER DESCAM, HAZCAM, NAVCAM, PANCAM EDR	image	none	surface geometry; camera model		total 701,512	10
Radiometric Correction	MER HAZCAM, NAVCAM, PANCAM CDR	image	none	surface geometry; calibration; camera model		total 2,925,302	16
Radiometric & Geometric Correction (single frames)	MER HAZCAM, NAVCAM, PANCAM RDR	image projected	none	surface geometry; calibration; camera model		total 1,866,442	65
Radiometric & Geometric Correction (mosaic)	MER HAZCAM, MI, NAVCAM, PANCAM Mosaic	image projected & mosaicked	none	surface geometry; calibration; camera model; mosaic		total 10,063	8